



Utilities Tech Outlook

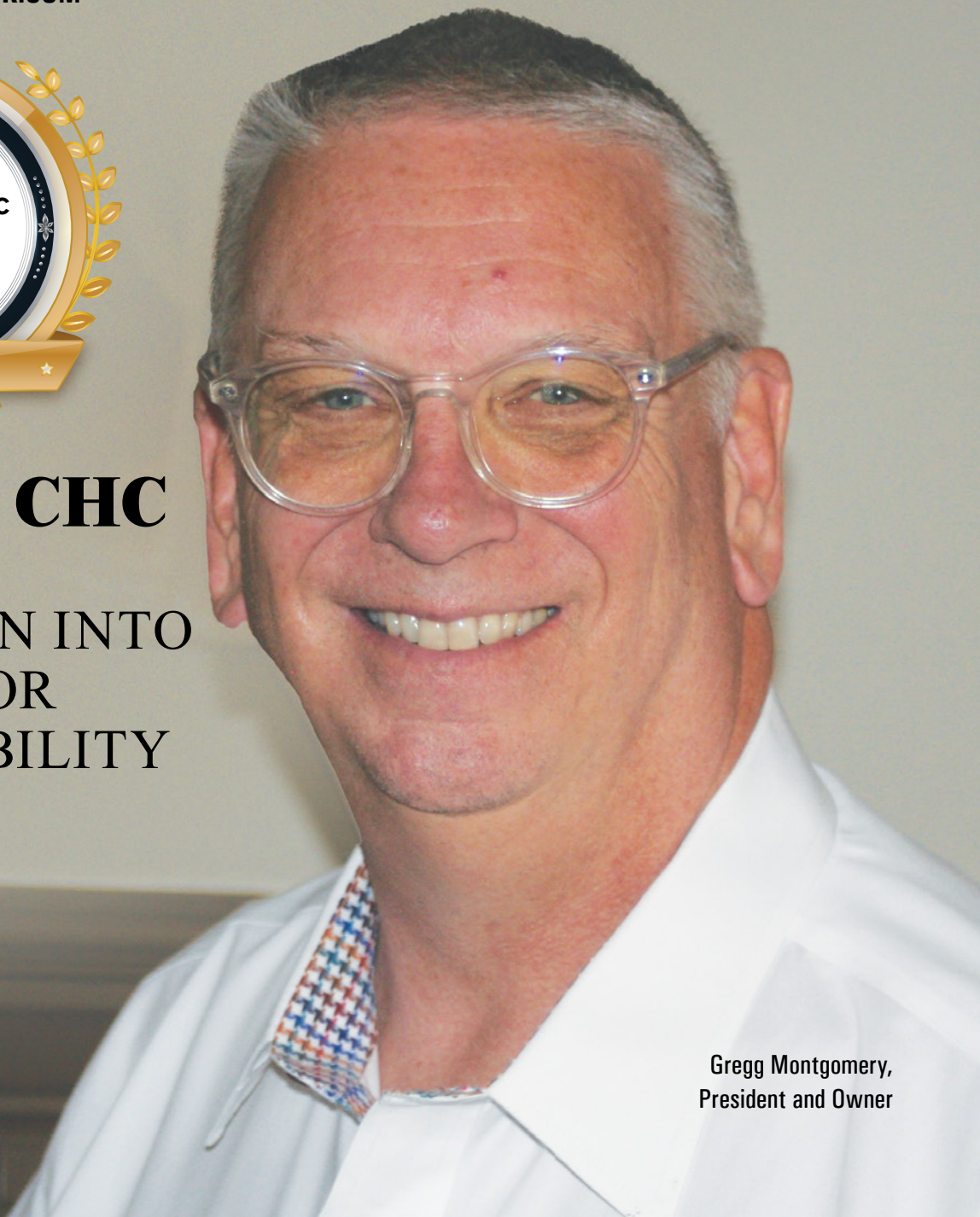
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VORTEX CHC TURNING CAVITATION INTO A FORCE FOR SUSTAINABILITY

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Gregg Montgomery,
President and Owner

VORTEX CHC

TURNING CAVITATION INTO A FORCE FOR SUSTAINABILITY

Vortex CHC has redefined water treatment through Controlled Hydrodynamic Cavitation (CHC), a patented technology that transforms a naturally destructive force into a precise, primarily mechanical solution that minimizes chemical use.

While the process relies on hydrodynamic cavitation, additional in-line components create small natural conversions of chlorides, enhancing beneficial biocidal action and assisting in creating activated silica. What was once considered damaging to pumps and turbines has been turned into a reliable method for treating water.

The Vortex CHC journey began in 1998, when its founders recognized the potential of harnessing hydrodynamic cavitation. By 1999, the first beta unit was installed in New Albany, Indiana. It continues to operate today, making it the world's longest-running industrial CHC system. The experimental breakthrough has since evolved into a scalable solution that enables industries to reclaim, reuse and safeguard water for the future.

Vortex CHC systems are engineered for HVAC, refrigeration and industrial process cooling and effluent reclaim. They prevent scale, control corrosion, and eliminate biological growth, while integrating filtration and process controls to improve efficiency and extend equipment life. The result is non-potable water that is safe for repeated industrial reuse and reclamation across diverse applications.

Unlike conventional chemical treatments, CHC relies on mechanical precision. Intense shear forces rupture bacterial cell walls through a process known as cell lysing, while simultaneously breaking down calcium carbonate into small, chain-forming crystals that can be filtered out before scale develops. Because microbes cannot adapt to these physical forces, the system ensures consistent, reliable performance. At the same time, it reduces both water and energy consumption, helping facilities cut costs and operate more sustainably.

With more than 25 years of experience, Vortex CHC has refined its approach to deliver both technical innovation and measurable outcomes. Its systems keep cooling operations running smoothly, extend equipment life, and provide industries and municipalities with sustainable water management solutions.

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Harnessing Cavitation without Destruction

Cavitation occurs when microscopic vapor bubbles form and collapse in a liquid, releasing tremendous energy. In uncontrolled environments, this process results in the corrosion of metal on things like boat propellers and pumps. The CHC breakthrough came when that destructive force was harnessed and directed in a controlled aqueous region away from the nozzles creating the microjets.

Vortex CHC achieved this by designing two opposing venturis, one rotating clockwise and the other counterclockwise. This innovation creates a zone where cavitation happens within the liquid rather than on equipment surfaces. Protected by unique IP on opposing Venturi nozzles, the process delivers the benefits of cavitation without the destructive side effects that have long plagued traditional systems.

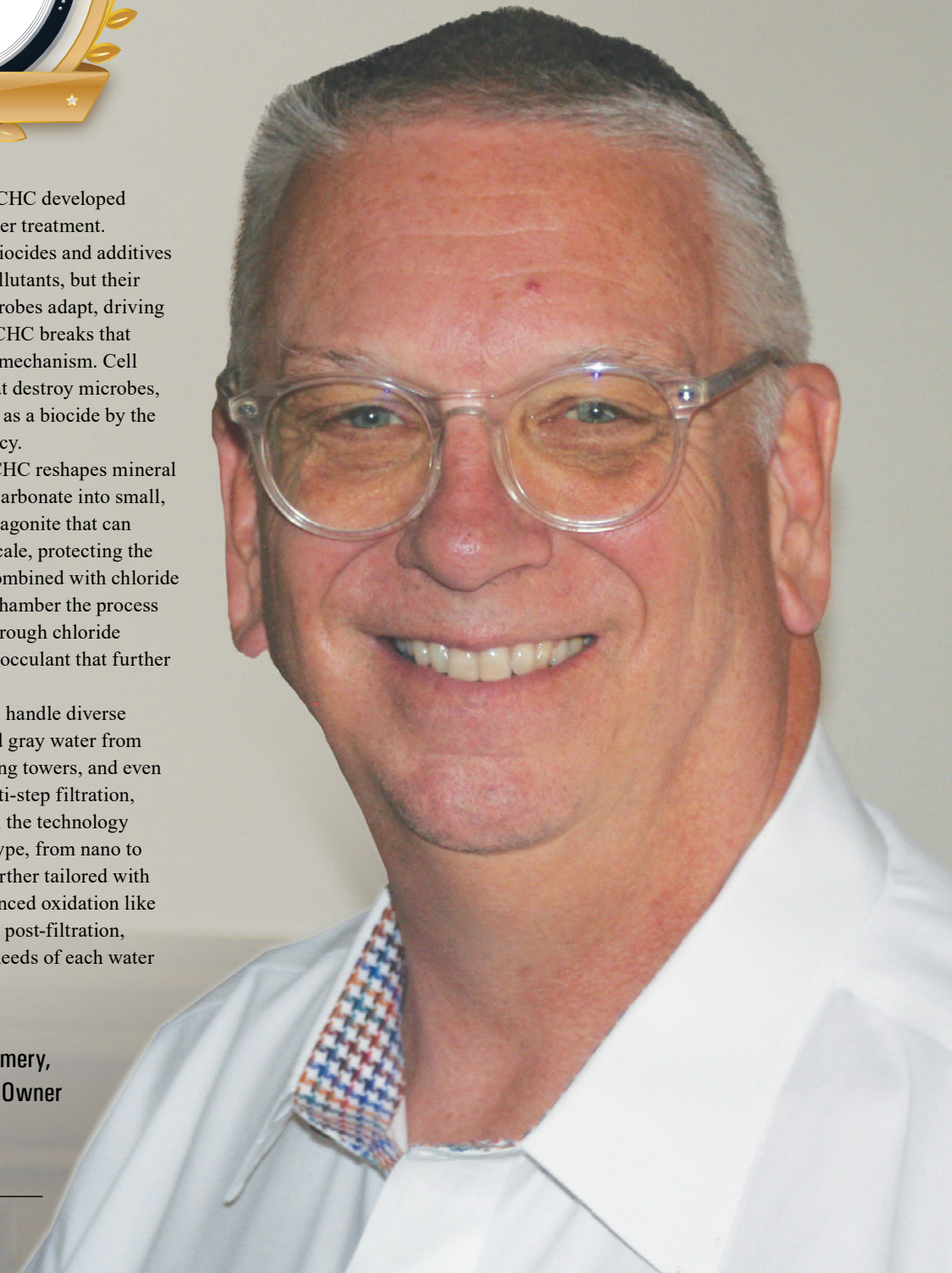


On this foundation, Vortex CHC developed a chemical-free approach to water treatment. Conventional methods rely on biocides and additives to control scale, bacteria and pollutants, but their effectiveness diminishes as microbes adapt, driving higher chemical use and costs. CHC breaks that cycle through a purely physical mechanism. Cell lysing helps avoid chemicals that destroy microbes, resulting in recognition of CHC as a biocide by the Environmental Protection Agency.

Beyond microbial control, CHC reshapes mineral structures. It converts calcium carbonate into small, chain-forming crystals called aragonite that can be filtered out before forming scale, protecting the cooling infrastructure. When combined with chloride conversion ahead of the HDC Chamber the process also produces activated silica through chloride conversion, creating a natural flocculant that further enhances water treatment.

The systems are designed to handle diverse application, such as effluent and gray water from industries, municipalities, cooling towers, and even car washes. With adaptable multi-step filtration, ranging from one to four stages, the technology manages particulates of every type, from nano to heavy solids. Systems can be further tailored with combinations of filtration, advanced oxidation like ozone or chloride reactions, and post-filtration, ensuring they meet the unique needs of each water source.

Gregg Montgomery,
President and Owner





“We want to be complementary rather than minimalistic. Meeting only the lowest standard for water discharge is not enough. We have set ourselves a higher bar because that is what the industry and the environment now require,” says Gregg Montgomery, president and owner.

From Car Washes to Industrial Plants

Innovation is most valuable when applied effectively. Vortex CHC has demonstrated proven results in cooling systems, municipal water treatment, landfill leachate management, and drought-affected regions.



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Car washes, for instance, are both prevalent and highly water-intensive. A typical wash can require 85 to 150 gallons of fresh water per vehicle. With CHC, systems now operate using less than 15 gallons of fresh water per wash, and the most efficient sites have reduced that number to below eight gallons. Water is continuously recycled, as much as 35 to 40 times per day at high-volume locations. The two-step process keeps the recycled water clean, odor-free and bacteria-controlled, which lowers both environmental impact and operating costs.

Food processing facilities provide another impactful opportunity. In these environments, water used for cleaning and wash-downs is heavily contaminated with flour, oils and sugars. Many plants rely on microbial digesters to break down waste. However, CHC introduces an additional layer of efficiency by reclaiming up to 97 percent of wastewater for reuse. Depending on local regulations, reclaimed water can return to service as process water, heat transfer fluid, or even wash-down water after further treatment.



The technology has also achieved significant results in highly water-stressed regions. In Arizona, CHC-based heat transfer systems became the first in the state to produce discharge that met or exceeded drinking water standards, eliminating the need for a permit. While this demonstrates the system's quality, its solutions are for non-potable reuse. Several cities have also adopted policies that allow car washes to use “purple water,” treated non-potable water, instead of drawing on limited drinking water supplies. CHC makes this shift both practical and reliable, further reducing demand on municipal systems.

“By reducing the strain on municipal systems, we contribute to community resilience in areas where water scarcity is most acute,” adds Montgomery.

Meeting Tomorrow's Water Challenges

Population growth, industrial expansion, and shifting climates have increased demand for clean water while reducing its availability. To address this reality, many municipalities are drawing from multiple sources of varying quality, which complicates consistent treatment. Vortex CHC systems are designed to adapt to these conditions, providing reliable treatment for non-potable reuse, minimizing chemical dependency, and ensuring water is suitable for industrial and agricultural applications.



Rising costs for water and sewer services have also made efficiency a business imperative. What was once viewed primarily as an environmental responsibility, saving millions of gallons of water, is now a direct bottom-line benefit. Vortex CHC strengthens that economic case by helping facilities reduce discharge volumes and qualify for municipal sewer credits, which are now a major driver of infrastructure upgrades.

Currently, Vortex CHC is focusing on four main quadrants; industrial heat transfer water, municipal effluent reuse, landfill leachate treatment, and large-scale industrial applications in agriculture and food processing. A new and rapidly growing focus is on data centers, which consume enormous volumes of cooling water. As artificial intelligence and cloud computing accelerate the expansion of data infrastructure, the need for clean, recycled cooling water is rising at an unprecedented pace.

This momentum extends into new geographies. In Canada, the agricultural industry faces mounting water pressures, creating strong demand for sustainable alternatives. Initial deployments of CHC systems are showing early, positive results, enabling industrial facilities and municipalities to reclaim water safely while reducing reliance on deep well injection and other costly disposal methods.

To support this growth and prepare for future needs, Vortex CHC is advancing its systems with real-time monitoring for compliance and expanded nano-filtration to target emerging

contaminants. These enhancements will provide customers with greater transparency and ensure that treatment capabilities keep pace with pollutants that have only recently entered the regulatory spotlight.

Raising the Bar for Responsible Water Use

By consistently exceeding regulatory requirements and focusing on practical, real-world outcomes, Vortex CHC has earned its place as a leader in chemical-free, sustainable water treatment. Looking ahead, stricter discharge standards and the rapid expansion of AI-driven data centers will require even greater innovation. Vortex CHC is equipped to address these demands with a foundation proven to be durable, adaptable and chemical-free.

By advancing its systems with real-time monitoring, regulatory reporting, and nano-filtration to address emerging contaminants and ensure treatment capabilities, Vortex CHC stays ahead of regulatory and industry needs. Its priorities include developing efficient heat transfer solutions for AI and data centers that consume tens of billions of gallons annually, expanding into municipal markets in drought-affected U.S. regions with a focus on landfill leachate treatment, addressing water scarcity in Canada's agricultural and industrial sectors, and continuing to strengthen monitoring and filtration for long-term performance.

At its core, Vortex CHC is about transforming the perception of water into a resource that must be reclaimed, reused and secured for the future. 